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ABSTRACT

The nature of teachers' attitudes toward the integration of instructional technology and the social and psychological factors that contribute to their acceptance or rejection of such technology were examined in this study. The study used a naturalistic methodology--an emergent design that is useful in studies where the definition of issues is vague at the outset--by using structured interviews and the factor analysis of an attitude response form. Five professional public school educators with varying numbers of years of experience were interviewed. Based on the data collected in the interview phase, similar categories of data (called factors) were created and organized into a classification scheme to reflect the expressed sentiments of these educators about instructional technology. The Teacher Attitudes of Instructional Technology (TAIT) survey was developed from the interview reports and categorization of the factors. One hundred forty-six graduate education students (36 males, 110 females) completed the survey. The factor analysis resulted in the identification of five prevalent factors that influence the use of fully mediated instruction: (1) curriculum content; (2) extension of traditional methods; (3) integration of instructional technology; (4) teacher initiative; and (5) what teachers believe the future holds. In general, study findings indicated that most educators are excited about applying instructional technology in the classroom, that they want to be involved in both the development and application phases, and that they believe the use of instructional technology is appropriate for all content areas. (20 references) (CGD)

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Integrating Instructional Technology in Educational Institutions: The Proper Role for Teachers

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Integrating Instructional Technology in Educational Institutions: The Proper Role for Teachers

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Integrating Instructional Technology in Educational Institutions: The Proper Role for Teachers

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In his article, *The Proper Study of Instructional Technology*, Robert Heinich (1984) pointed out that the evolution of instructional technology has been hampered by its historical roots in training teachers to operate and apply instructional tools within the limited confines of existing educational systems. Many educational institutions are bound by the continuation of an equipment-training mentality, even though today's user friendly media and computers require much less training to operate than the manually adjusted media and mainframe computers of yesterday. Heinich (1985) further contended that there are forces within educational institutions that perpetuate the craft nature of teaching and limit the development of those instructional technologies which could be viewed as threats to the teachers' power structure. He recommended that researchers should investigate the nature of these forces and devise strategies for expediting more widespread application of instructional technology.

In current educational environments, teachers and trainers are most comfortable when they are allowed to control the practice of their craft in the classroom. As long as teachers view themselves as authorities in developing, selecting and using instructional support materials, their power structure remains intact. But as applications of instructional technology result in more self-sufficient lessons, which are in turn embedded in more precisely specified systems of instruction, many teachers may become less effective because they fear that their contribution to the learning process is diminishing.

Who should be first to encourage the integration of instructional technology?

Heinich has identified existing conditions in educational institutions which must change if the benefits of instructional technology are to be fully realized. The issues and potential impact on students, teachers, and teacher educators are substantial. Remedies must be chosen carefully. We can, as Heinich has suggested, attempt to address these issues at the institutional level by encouraging administrators and government policymakers to re-examine educational institutions and adopt cost-effective instructional systems which incorporate electronically-mediated courses. But, even if such efforts are successful, the sudden appearance of a number of legislated electronic courses will not go unchallenged. And, these challenges may only serve to ingrain the craft role of teachers and trainers.

In a point-of-view statement which appeared in *The Chronicle of Higher Education*, David Grossman (1987) attacked the incorporation of electronically-produced external courses. Among other criticisms, he

argued that such courses: are often inferior to those which would be used by the institutions that export them, separate faculty from course development, trivialize education, and threaten the vitality of the university by encouraging a homogenization of instruction. Whether or not one agrees with Grossman's position, the political explosiveness of such statements must not be underestimated.

Allan Bloom (1987) has criticized the current structure of American universities for creating an anarchy of specialized disciplines that undermines the foundation of liberal arts education. Evidence for this anarchy is apparent in the way that departments within universities are becoming more specialized both in terms of course offerings and resources. Bloom and other educators are concerned that, while this narrowing of curricula and the specification of resources may prepare the student for short term job opportunities, it is ultimately crippling their abilities to reason in ways that will allow them to adapt to inevitable life changes encountered in a complex society.

In light of the current social climate toward education, a large-scale strategy of lobbying administrators and legislators to incorporate a wide range of mediated courses could very well backfire in the form of a rising tide of criticism toward instructional technology. The problem is that, despite the need for change, a critical mass of popular support is required before revolutionary changes will be successful in social institutions. Consider the policies and institutional restrictions which led to the United States' involvement in Vietnam. The central thesis of Colonel Harry Summers' (1982) critical review of strategies applied during the Vietnam war was that "...a lack of appreciation of military theory and military strategy - especially the relationship between military strategy and national policy - led to a faulty definition of the nature of the war. The result was the exhaustion of the Army against a secondary guerrilla force and the ultimate failure of military strategy to support the national policy of containment of communist expansion (p. VII)."

Summer further explained that one of our greatest errors was to allow U.S. Forces to be involved in the internal struggle of Vietnam politics and pacification. At a time when the Vietnamese people were leaning toward a democratic form of government, the infusion of U.S. troops to fight *their war* only served to alienate the populace, ultimately resulting in greater acceptance of Communism. Summers believed that a more appropriate strategy would have been to seal off the borders of Vietnam, thereby preventing the entry of unstabilizing elements and establishing an environment in which the Vietnamese could bring their internal struggle to a close.

The point in this analogy is that without popular support from teachers who clearly understand the benefits of instructional technology, attempts to force the use of electronically-mediated instruction in educational institutions could be disastrous. The results could be the same as those experienced in Vietnam. In the education scenario, the secondary guerilla force that experiences disparate victory would be the teachers who maintain their craft status. This unseemly scenario would only impede the acceptance of instructional technology while failing to serve the best interests of both teachers and learners.

Teacher Attitudes of Instructional Technology

A long term strategy for integrating instructional technology should be one of winning support at all levels that influence the structure of educational institutions. In order to accomplish this, the potential for conflict must be recognized and averted as the involved parties begin to posture and negotiate their positions (Frost and Wilmot, 1978; Jandt, 1973). Anderson (1980) pointed out that instructional materials which have not been influenced by teacher input have a history of vanishing due to lack of teacher interest or commitment. And in an analysis of factors that influence the success of computer-based training (CBT), McCombs (1985) determined that the processes of defining instructor roles during implementation and the maintenance of student/instructor interactions was critical in assuring the success of CBT. She also claimed that this process must be done actively with the instructors in order to gain their confidence. Once a critical mass of teachers advocate the use of instructional technology, Heinich's advice of lobbying the governing bodies can take place in an atmosphere of coalition rather than conflict. The logical extension is that as the base of support grows from within the educational institutions, the favorable climate will help to increase acceptance and bolster the evolution of instructional technology.

This study investigates the nature of teachers' attitudes toward the integration of instructional technology. Our intent is to shed light on the social and psychological factors which contribute to teacher acceptance and/or rejection of instructional technology. Once these factors are more completely understood, they may serve as guides for curricula decision making, instructional design strategies and the evolution of institutional policy.

Method: Naturalistic Inquiry

Because the components of teachers' belief structures were unknown and highly subjective, a naturalistic paradigm was used as the guiding research design. The naturalistic methodology is an emergent design which is particularly useful in studies where the definition of issues is vague at the outset, and researchers are interested in revealing the parameters of the issues and the factors effecting those issues. The naturalistic inquiry adheres to the rigor of tandem data collection techniques. Specifically, this meant the use of structured interviews and the factor analysis of an attitude response form. Guba, (1981) encouraged the combination of a rationalistic approach (attitude scale) with a naturalistic approach (interviews) in qualitative research.

The interview phase of the qualitative analysis began with the following assumptions:

1. The data would be value-laden because they are based primarily on the belief structures of educators, rather than on facts gathered by empirical research.

2. Multiple realities would be expressed by the various educators, in that their views about the need for and use of technology in the classroom would include a number of varying beliefs and opinions.
3. Through verbal communication, the human can be a legitimate instrument for data collection.
4. During the interview phase of the research, a small, purposive sample would be acceptable because replication of data was the criterion to be achieved.
5. Boundaries of the interviews were determined by the focus on factors which influence the acceptance and/or rejection of instructional technology.
6. Data from the interview stage of the research would be used to create a comprehensive set of items as a basis for developing the attitude scale.
7. Factor analysis of the attitude scale would be used in considering the appropriateness of the categories identified through the interviews.

The interviews

Five professional public school educators with varying numbers of years of experience and different content area expertise were interviewed. Each interview lasted approximately 30 minutes and was conducted following a similar outline. The number of interviews conducted in this phase of the study was determined by the amount of replication of data collected in each of the interviews.

At the beginning of each interview, educators were asked to fill out a consent and demographics form that identified: number of years of teaching experience, grade levels taught and types of technology used for professional purposes.

After the educators completed the demographics form, a few minutes were spent with introductions and getting acquainted. The introduction concluded as the interviewer stated the purpose and procedure for the remaining portion of the interview. The interviewer stated that the reason for the interview was to get ideas from the educator about how he or she felt instructional technology should be used in the classroom.

At this point, the educator was asked to define his or her concept of instructional technology. This step was included in the interview process to make sure that both the interviewer and the educator had a similar understanding of the general concept of instructional technology before proceeding with any further investigation of the educator's beliefs about its value and use in the classroom. The working definition of instructional technology used for this study was: "The discipline of creating, evaluating and disseminating educational materials through various forms of media including (but not limited to): sound-slide shows, overhead projections, bulletin boards, television, films and computers." If an educator would have given a definition that did not adhere to the working definition, the interviewer would have suggested a definition more closely suited to the working definition. However, this logistical problem did not arise during the interviews.

The main portion of the interview consisted of seven questions, which were asked in the same order to each of the educators. The questions were:

A) In your professional situation, how do you typically use instructional technology?
B) What are the advantages of using instructional technology?
C) What are the disadvantages of using instructional technology?
D) What are the differences between teachers who don't use instructional technology and teachers who do?
E) In your picture of the ideal situation, what types of instructional technology would be available to you to help you reach your students?
F) As more sophisticated types of instructional technology become available, what do you imagine the role of the classroom teacher will be in the future?
G) What is your opinion about the role teachers should take in designing instructional technology and why?*

* This question was prefaced with the explanation of the following debate: *There is a debate in education today about the role that teachers should take in designing fully mediated instruction. Some people say that teachers should be the principal designers of software and materials to be used with instructional technology, because they are the ones who work most closely with students and they are most aware of students' needs. There are others who think that instructional software and materials should be developed by full-time instructional designers and that a teacher's role should not be as a developer of instructional materials but as one who implements the instructional designers' products in the classroom environment.*

Analysis of the interviews

Based on the data collected in the interview phase, categories were created to reflect these educators' expressed sentiments about instructional technology. After each interview was completed, data from the interview were chunked into separate topic categories and each unit of data was placed on a 3"x5" note card with a numerical code that identified the source of the data, and a working title to denote the type of data on the card. After the completion of all interviews, cards were sorted into categories of similar data, and names were developed for each unit of similar data. The categories were called factors and opposing positions were identified within each factor. The factors identified were:

Entertainment value represents the belief that fully mediated instruction is primarily entertainment and therefore non-educational. The opposing belief is that students learn a considerable amount from fully mediated instruction because they are interested in what they observe.

Teacher displacement represents the belief that teachers' classroom duties will be displaced by instructional technology. The opposing belief is that instructional technology will continue to be a tool, albeit a more advanced one, for teachers to utilize in their classrooms.

Need for innovation acknowledges that, due to differing personality traits, some teachers want to be at the forefront of educational

change. The opposing belief is that many teachers are comfortable with the status quo in education.

Decline of the printed word represents the belief that instructional technology is contributing to the loss of the written word. The opposing belief is that instructional technology merely emphasizes different critical thinking skills for processing information.

Intransigent factor is based on the belief that certain (often described as older) teachers are set in their ways and less willing to experiment with advances in instructional technology.

Teacher control is based on the belief that the teacher should dominate the classroom and dictate lessons to students. The opposing belief is that the teacher is viewed as a facilitator who helps students to become independent learners and to make their own decisions.

Dehumanization represents the belief that instructional technology is mechanized, dry, inflexible and unresponsive to students. The opposing belief is that instructional technology produces a more thoroughly thought-out and systematic approach to lessons than any single teacher can and therefore better meets the needs of individual learners.

Content specific refers to the belief that some content areas are appropriate for use of instructional technology while many others are not. The opposing belief is that all content areas can benefit in some way from using instructional technology.

Techno-literacy represents the belief that some teachers are naturally more comfortable with using technical equipment to aid instruction. The opposing belief is that many teachers do not understand how technical machines work and that they should not be forced to learn about them.

Prepare for the future is the belief that instructional technology should be a primary consideration in school expenditures because it is the wave of the future. The opposing belief is that instructional technology should be a secondary consideration because it is futuristic and educators need to concentrate on meeting the needs of students today. (This factor was based on the question of allocation of monetary resources.)

Inadequate software refers to the concern that instructional technology is not ready for integration into classrooms because there is not much effective software available. The opposing belief is that instructional technology is ready for the classroom just as soon as teachers are willing to make the effort to design programs for their own particular needs.

Limited time represents the assumption that, given limited time and resources, teachers should spend their energy working with students. The opposing belief is that, given limited time and resources, teachers should attempt to make lessons as creative, interesting and understandable as possible, and use of instructional technology can aid this process.

Development of the survey instrument

After the initial review of the interview reports and categorization of factors, the first draft of the survey was developed according to the guidelines described in the *Survey Questions: Handcrafting the Standardized Questionnaire* (Converse and Presser, 1986).

A panel of three experienced educators who were familiar with the study and results of the interviews assembled to create the items for the initial draft of the survey. Each member worked independently to write 10 Likert scale items for each of 12 different factors that were identified from a pattern analysis of the interview information. The items were assembled and produced as a numbered list of items. This list of numbered items was then independently reviewed by each member of the panel. The panel met again as a group to review the independent critiques and agreed on the final list of 120 items. Finally, the order that the items would appear on the test form was determined using a random number generator and the version of the survey that was used in this study was produced.

The Teacher Attitudes of Instructional Technology (TAIT) survey included 10 items for each of the 12 factors identified during the interviewing phase. Responses to each item are marked on a 5-point Likert scale. A response of 1 indicates strong agreement with the statement, 3 is a neutral response and 5 indicates strong disagreement. A majority of the items (81) directly referred to opinions about the use of fully mediated instruction. Directions on the first page of the TAIT survey included definitions for the following terms:

Instructional Support Media -- Educational materials which are used by teachers to present ideas. These includes overhead transparencies, films, television programs, slides and computer software when the materials are used to assist the teacher in delivering lessons.

Fully Mediated Instruction -- Lessons or courses which are presented by media without any required assistance from a teacher. These include courses which are delivered entirely on television or computers. Fully mediated instruction is distinct from instructional support materials because it is designed so that it can be used without any intervention from a teacher.

Administering the TAIT Survey

The survey was administered during the beginning sessions of graduate education courses held during the 1988 Summer and Fall semesters at the University of Kansas. Observers explained that responses would be anonymous and that completion of the surveys was voluntary. The subjects were asked to review the directions, paying special attention to the definition of terms. After responding to appropriate questions pertaining to the directions or definitions, the observer instructed the subjects to complete the survey.

Of the 146 subjects who completed the survey, 36 were males and 110 were females. The graduate education students represented a broad range of educators, including those prepared for both elementary and secondary levels, a variety of content areas and international education.

Factor Analysis

The objective of a factor analysis is to reduce a large set of variables to a smaller set categories or factors that reflect the observed results (Anderson, Basilevsky, Hum, 1983). The Handbook of Survey Research (Rossi, Wright, and Anderson, 1983) was used to begin the process of reducing the initial set of 120 items down to a manageable number. The SPSSx statistical package was used in adhering to the following procedure described by Bohrnstedt (1983. p.102).

1. Conduct an exploratory factor analysis using the Maximum Likelihood procedure.
2. Decide on the number of factors needed to explain the covariation among the items using both the X^2 and Tucker-Lewis statistics for reference.
3. Examine the Eigen values of the rotated and unrotated solutions when $m > 1$ in order to determine if the items are meaningful or unwanted.
4. Remove the items that are poorly related or represent more than one domain.
5. Use a confirmatory analysis (Varimax) to refactor the remaining items to verify that they are congeneric.

Results from the TAIT Survey

The factor analysis resulted in the identification of five prevalent factors that concern the use of fully mediated instruction. After reviewing the items that were correlated with each factor, a representative title was established for each factor. Some items were recoded so that the factor means would accurately represent opinions towards the concept expressed in the factor's title. For example, one of the items that correlated with Teacher Involvement (factor four) was -- *The initiative to use fully mediated instruction should come from teachers* (M=2.16), and another factor four item was, -- *The main reason that some teachers don't use fully mediated instruction is because they are too lazy to make the effort* (M=3.93). In this case, the second item was recoded so that the 1 responses (strong agreement) became 5s (strong disagreement), the 5 responses became 1s and so forth. Recoding of the second item in determining the factor four mean served to more accurately reflect the opinions regarding the willingness of teachers to become involved in using fully mediated instruction. Correlations for the items associated with these five factors ranged from .38 to .84. Following is a list of the factors and representative survey items for each factor:

1. ***Curriculum Content*** (M=2.21, SD=1.09). On the 5-point scale, teachers agreed that curricula content areas like math and reading can be effectively taught using fully mediated methods. However, this belief varied somewhat between content areas. For example, there

was agreement that, *English is an appropriate content area for fully mediated instruction* (M=2.7, SD=1.3), but there was even greater agreement with the statement that, *Math is an appropriate content area for fully mediated instruction* (M=2.2, SD=1.2).

2. ***Extension of traditional methods*** (M=2.17, SD=1.15). The findings indicated an acceptance of the belief that fully mediated instruction can successfully augment traditional methods of instruction. For example, there was disagreement with the statement, *Fully mediated instruction does not coexist well with traditional educational methods* (M=3.71, SD=1.07). And, this notion correlated with the belief that *Fully mediated instruction should go beyond the scope of individual lessons* (M=2.18, SD=1.04).

3. ***Integration of Instructional Technology*** (M=1.63, SD=.93). This factor addresses teachers' beliefs about how instructional technology can be used to augment instruction and who should be involved in its development. The findings indicate strong support for the belief that integration with other classroom teaching techniques is the answer. The greatest agreement among all items was to the statement: *Instructional support media compliments the teacher's role in educating students* (M=1.45, SD=.65). And, this group of educators would like to be involved in implementing integration. -- *I would be willing to integrate instructional support media into my lesson plans* (M=1.57, SD=.73).

4. ***Teacher Initiative*** (M=2.1, SD=1.01). This factor expands on the notion that educators are willing to be involved in the integration of instructional technology. A reasonable explanation for educators' expressed belief that, *The initiative to use fully mediated instruction should come from teachers* (M=2.16, SD=.96), is that, *Teachers have more faith in instruction of their own design* (M=2.19, SD=1.0).

5. ***What Does the Future Hold*** (M=2.52, SD=1.10). As the title of this factor implies, some soothsaying is needed here. Those subjects who agreed with the statement that, *Few teachers will be displaced by fully mediated instruction in the future* (M=2.38, SD=1.1) also tended to agree with the statement that *Fully mediated instruction is a more systematic approach to instruction than traditional classroom instruction* (M=2.65, SD=1.09). Is this a belief that traditional instruction needs to become more systematic? A condemnation suggesting that instructional technology is impersonal? A realization that certain aspects of instruction need a highly systematic approach which can be best served by instructional technology? Or, is it a reflection of the uncertainty of what lies ahead for instructional technology and the careers of educators?

Conclusions:

Naturalistic research methodology was useful in revealing the dimensions of the belief structures through which teachers form opinions about the development and use of instructional technology. Our initial subjective notions were expanded through the interview sessions, which were the basis for the formation of the first set of categories. Analysis of the survey provided a means of sampling a larger pool of the population and resulted in a recasting of some earlier formed categories.

The general conclusion is that most educators are excited about applying instructional technology in the classroom and that they want to be involved in both the development and application phases. Results from the sample used for this study did not suggest an undercurrent of resistance toward instructional technology. However, this conclusion should be tempered by a recognition that the sample consisted of educators who had elected to pursue graduate education, and most of the participants lived near a major university or a large metropolitan area. A broad sampling of classroom teachers in both rural and urban districts may reveal somewhat more tentative opinions toward instructional technology.

For the most part, the belief categories determined by the factor analysis confirmed assumptions about the contributing factors drawn from the interviews. Opinions that instructional technology is more appropriate for some content areas, e.g. Math and Science, than others, e.g. English, prevail. Although there are different levels of agreement, educators appear to believe that the use of instructional technology is appropriate for all content areas.

When asked the question, *How should instructional technology be brought into the curricula?* the overwhelming response is *through integration.* Teachers seem to recognize that fully mediated instruction has the potential to deal with a broad base of curricula content and they believe that it is best used in conjunction with traditional approaches to teaching. They appear to be convinced that computers and other informational technologies will continue to shape all aspects of society and they want to play significant roles in preparing students with the necessary skills for adapting to the technological changes which are sure to come in the future.

Teachers express a willingness to extend the effort necessary for learning how to develop and apply instructional technology. However, they are concerned that they don't have enough time to learn all they need to know. And, they will strongly oppose efforts to channel teacher salary funds to the development of instructional technology. Out of the 120 items in the TAIT survey, the greatest disagreement ($\underline{M}$=4.37, $\underline{SD}$=.95) was to the statement, *Some of the money now designated for teacher's salaries should be spent on acquiring good fully mediated instruction.* Teachers are willing to extend the effort necessary to apply instructional technology in their teaching but when it comes to their salaries, hands off.

Recommendations

Teachers are the foundation of our educational institutions. They shape the instruction and activities in the classroom and they are role models for our students. Instructional technology will not reach its full potential without their support. Some who ponder the future of educational institutions in light of instructional technology (Heinich, 1985; Perlman 1988) believe that a restructuring of the systems will be needed before any significant advances are realized. Revolutionary changes may be needed, but such changes must be sensitive to the needs and aspirations of teachers. As Heinich emphasized, even well-designed instructional technology can be sabotaged by a disinterested teacher.

The reason that teachers strongly disagree with statements regarding the use of teacher salary funds for instructional technology may have more to do with their dignity than their pocketbook. Strategies for incorporating and training in the use of technology must empower the teachers in ways that give them a sense of control over their own destinies (Frymier, 1987; Grady 1988; Maeroff, 1988). Teacher education programs should include required courses which focus on topics for integrating instructional technology throughout grade levels and content areas - not those that are restricted to programming or production techniques (see for example Bruder, 1989; Rossenberg, S.& Bitter, G. (1988)).

Teachers should also view themselves as active participants in the evolution of instructional technology. One way to empower teachers is to provide greater teacher control features in instructional software. The teachers in this study strongly agreed that, *Educational software should be designed to allow for modifications by teachers* (M=1.64 SD=.88). Interactive courseware should be designed to allow teachers to control such features as time, difficulty level, feedback, questions and certain aspects of content.

An open environment for exchanging ideas between teachers and developers of instructional courseware should be developed. Consider how the introduction of the personal computer has changed attitudes toward the application of technology to management problems encountered in business and industry. The roles of millions of professionals have gone through significant changes as the result of computerizing the workplace. In many cases, these changing roles are being adopted with enthusiasm, not antagonism. Secretaries who have experience with word processors are not requesting that their typewriters be returned.

In some business applications, personal computers are simply tools for assisting workers in more efficiently accomplishing existing aspects of their job, such as word processing. They serve in much the same way that media tools serve the craft nature of teaching. However, as personal computers begin to appear on the desks of middle management, a much broader impact on business institutions is emerging in the form of technological approaches to problem solving (Scully, 1987).

The middle manager's romance with personal computers began with recognition of the power of databases for keeping track of employees and spreadsheets for controlling accounts. But recently, middle managers are beginning to use project management and advanced spreadsheet software for decision-making, long-term planning and forecasting. In this way, the personal computer has acted as a conduit through which more systematic procedures are applied to solving the complex problems that successful business must overcome as they enter the information age. As more advanced and more user-friendly authoring software becomes available to educators, the personal computer may serve a similar function in educational institutions by developing a broader acceptance of instructional technology.

If David Pearlmen's (1988) prognosis for the future of educational institutions is realized, there will be new and expanded educational opportunities in such disciplines as learner analysis, courseware development, home or rural-based distance learning and educational evaluation. The obvious candidates for these new positions come from the ranks of those who are currently teaching in our schools. Mechanisms for allowing teachers to develop instructional technology should not come only from universities, there must be a greater emphasis on professional development from school systems and from state education offices. When teachers also become developers, they are likely to take a more personal interest in the quality of instructional technology and thereby become more conscientious critics. Educational institutions can then focus on their primary task, and become places where teachers are united in efforts to apply instructional technology to the enhancement of learning throughout the curricula.

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